

Malaria Capacity Building in Liberia: The US Navy Joins Forces to Defeat a Deadly Foe

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Malaria ranks among the top three important vector-borne diseases for the US military. In response, over the past five years, the Armed Forces Health Surveillance Center – Global Emerging Infections Surveillance and Response System (AFHSC-GEIS) and Department of Defense (DoD) overseas labs have conducted several projects aimed at enhancing or establishing hospital-based febrile illness surveillance platforms and conducting arthropod surveys (Fukuda *et al* 2011). The Navy Entomology Center of Excellence (NECE) in Jacksonville, FL recently collaborated with the US Naval Medical Research Unit No. 3 (NAMRU-3) and the Liberian Institute for Biomedical Research (LIBR) to deliver a two-week Public Health and Vector Control Course for 22 students from the Armed Forces of Liberia (AFL). The classes were directly aimed at teaching skills to control *Anopheles gambiae*, the primary malaria vector in Liberia. During the final two days of the course, students conducted an indoor residual spray operation (IRS) for barracks housing AFL soldiers. Large-scale IRS has remained the cornerstone of the World Health Organization (WHO) malaria control plan since the 1950s and is one of the four major components of the President's Malaria Initiative (PMI) aimed at reducing malaria transmission (Hoel *et al* 2013).

Responding to a high incidence of malaria infections among US forces in 2010, NAMRU-3 and NECE have conducted six spray missions applying insecticides to the insides of various residences on two major military installations (Obenauer and Stoops 2012). The primary objective was to protect US Forces from being bitten by this highly anthropophilic,

endophagic and endophilic mosquito species. Since its inception, no malaria cases have been reported from US active duty members of Operation Onward Liberty. The military barracks housing US Forces are now being treated by private contractors on a regular basis; however AFL barracks have been left untreated in part due to lack of training and support. As part of a larger component from the DoD Global Emerging Infections System (GEIS) funding, the past two years have focused on capacity building and “training the trainer” to sustain malaria control efforts among AFL members.

The recent course was a combination of classroom and field instruction covering basic insect taxonomy, general adult and larval mosquito identification, mosquito biology, vector-borne

diseases, mosquito surveillance and control, insect toxicology, integrated pest management and personal protective equipment. Classes were held at the medical clinic on the Edward Binyah Kesselley (EBK) military base. Classroom sessions consisted of Power Point® presentations, small group discussions and exercises, while afternoon field sessions involved hands-on activities that reflected the previous classroom instructions; see Figure 1. The final two days of the course were dedicated to treating over ten AFL enlisted barracks with Demand® CS (lambda-cyhalothrin) using two types of sprayers. The majority of IRS applications in Liberia rely heavily on hand-compression sprayers, and while effective, this method is extremely labor intensive, especially given the number of buildings to treat on base. Therefore, AFL students were



Figure 1: Lt Matthew Yans, an instructor from NECE, discusses the procedures for collecting *Anopheles gambiae* mosquito larvae.

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Figure 2: A student applies insecticide to the walls of EBK barracks with a JQX-12 compressed backpack sprayer.

instructed on how to operate and maintain Stihl™ backpack sprayers and the JQX-12, an innovative backpack sprayer developed by Dorendorf Advanced Technologies LLC, funded by the Deployed Warfighter Protection Program (DWFP), that uses two compressed gas cylinders; see Figure 2. Both sprayers allowed the applicator to maintain a sustained tank pressure of 55 psi without having to stop and manually repressurize the tank.

Advanced preparation is essential for any successful spray mission. The class was divided into four teams consisting of a sprayer, a guide, a water/fuel/insecticide director, and one instructor, while the remaining students were urged to assist in the equipment transportation. The majority of AFL members live with their families, so the EBK base commandant instructed all family members to move their belongings before spray teams arrived; see Figure 3. This facilitated maneuvering throughout the buildings,



Figure 3: Liberians living on EBK military barracks removed their furniture and belongings in preparation for spray teams to treat the inside of their homes.

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Figure 4: Students and instructors pose with their spray equipment for a quick photograph after treating over 240 rooms onboard Camp Edward Binyah Kesselley, Monrovia, Liberia, April 2014.

prevented any inadvertent property damage, and lessened the likelihood of anyone coming in contact with the

insecticides. Moreover, this allowed adequate time for teams to brief families about malaria and any concerns

they had regarding the insecticides. Spraying commenced at 09:00 and lasted until noon. In total, 220 rooms



Figure 5: Students and instructors from the 2014 Public Health and Vector Control Class present their certificates after a successful course completion and spray mission, Monrovia, Liberia, April 2014.

were treated over two days; teamwork played an enormous part in the successful execution of the program; see Figure 4. Both sprayers performed flawlessly. However, it was noted that the JQX-12 compressed gas sprayer provided exceptional spray coverage and was well received by students for its speed and ease of use.

At the conclusion of the course, a graduation ceremony was held at the base clinic; see Figure 5. At the ceremony, Col Prince C Johnson III, Camp EBK Commander, and Dr Josiah George, AFL's Chief Medical Officer, promoted a sense of partnership and appreciation. The AFL Preventive Medicine team is joining the collaboration and serving as member of the US Africa Command West Africa Malaria Task Force (WAMTF) to assist NECE and NAMRU-3 in the upcoming WAMTF training that will be held in Liberia. The course will be an effort to provide mosquito training among eight countries militaries public health programs that will have a regional impact in malaria control initiatives.

Building public health capacity remains a cornerstone for many developing countries in order to facilitate peace and prosperity. Since NAMRU-3

and NECE involvement with Liberia over four years ago, there have been enormous strides by the Liberians to turn the tide against malaria after long and brutal civil wars. Future vector control training courses with NECE seeking status as a WHO Collaborating Center on Vector Control are anticipated with other West African countries.

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